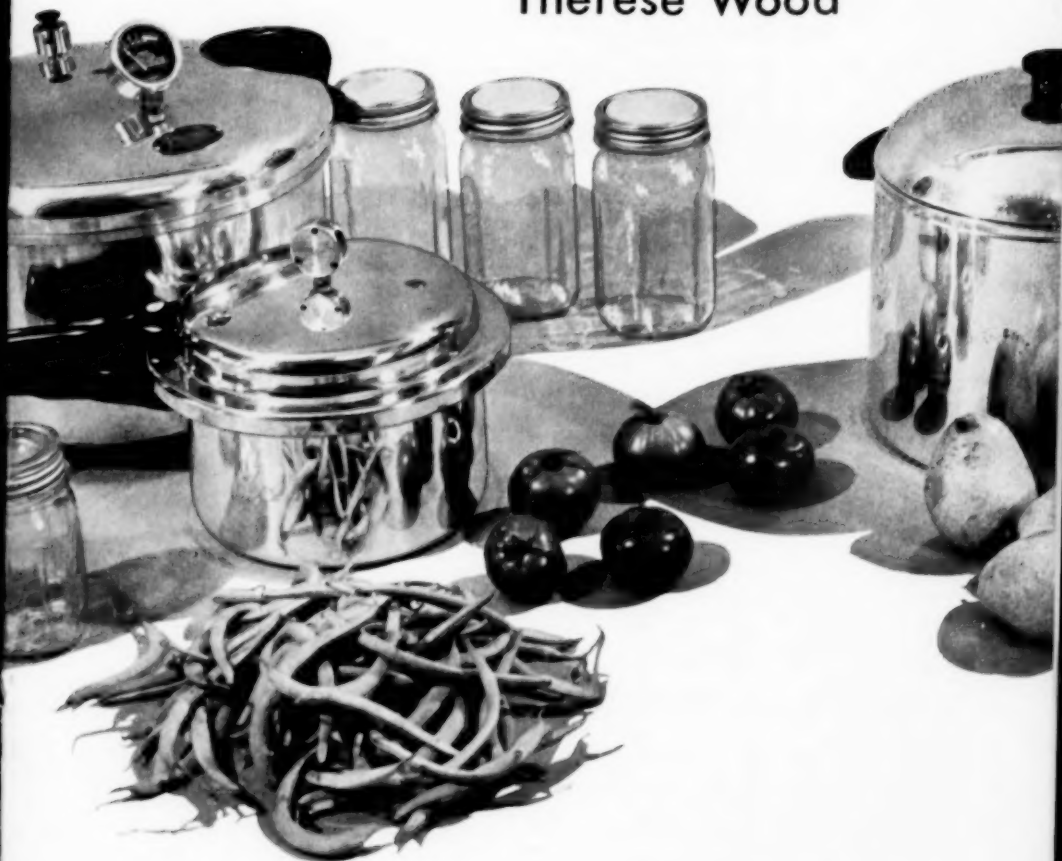


HOME CANNING

of Fruits and Vegetables

Therese Wood



Cornell Extension Bulletin 792

IN BRIEF:

Points to consider before you begin:

Equipment for canning.....	5-7
Methods for sealing glass jars.....	8-9
Approximate yield of canned fruits and vegetables from fresh produce.....	10

Fruits, Tomatoes, and Juices

Boiling-water bath method.....	11
Sugar sirups for fruits.....	12
Specific directions for canning fruits and tomatoes with time tables.....	13-17
Specific directions for canning juices.....	17

Vegetables

Pressure cooker method.....	18-19
Specific directions for canning vegetables with time tables.....	20-25

Storage of canned food.....	26
-----------------------------	----

Spoilage.....	26-27
---------------	-------

Some canning problems and how to prevent them.....	28-29
----------------------------------------------------	-------

Reprinted August 1956

A publication of the
New York State College of
Home Economics, a unit of the
State University of New York
At Cornell University

HOME CANNING

of Fruits and Vegetables

Therese Wood

For generations, canning has been a popular way for homemakers to preserve food; but the recommended methods have changed from those of grandmother's day as specialists have learned more about causes of food spoilage.

Canned food, if it is to "keep," must be free from the tiny organisms that bring about spoilage. These yeasts, molds, and bacteria as well as enzymes that cause decay must be destroyed by heat after the food is in the containers. Once they are destroyed, the food must be kept from contamination by a tight seal on the jars or cans. The amount and temperature of the heat needed are different for the different kinds of food.

The purpose of this bulletin is to give you instructions and timetables for preserving food safely.

RECOMMENDED CANNING METHODS

The canning methods recommended are the *boiling-water bath* for fruits and tomatoes and the *steam-pressure cooker* for all vegetables except tomatoes.

In the boiling-water bath a temperature of no higher than 212° F. is reached. This is considered adequate for canning fruits and tomatoes but not for other vegetables because these require the higher temperatures of the pressure cooker to kill spores of bacteria in vegetables.

Fruits and tomatoes may be packed raw or may be preheated before packing. It is recommended that some vegetables be preheated before they are packed into containers.

METHODS NOT RECOMMENDED

Other methods of canning sometimes used by homemakers include the so-called *open-kettle* method and *oven canning*. These are *not* recommended. In the open-kettle method, cooking of the food probably destroys the organisms that cause spoilage of fruit and tomatoes, but yeast, molds, and bacteria may come in contact with food while it is being transferred from the kettle to the jar. In addition, there may not be enough heat present to give a tight seal. If this method is used in canning fruits and tomatoes, the jars should be processed for 10 minutes in a boiling-water bath to insure a tight seal and destroy any yeast and molds. The open-kettle method is not satisfactory for vegetables.

Oven canning is influenced by so many variable conditions that it *cannot be recommended as a safe method of food preservation for any product*. When jars seal during processing in the oven, steam builds up inside the jars and can cause an explosion. Oven canning has resulted in some serious accidents.

Preservatives and *canning powders* are not necessary in the keeping of canned products and are *not* recommended.

ASCORBIC ACID

The addition of 150 milligrams of ascorbic acid (vitamin C) to a pint of applesauce, pears, peaches, plums, or sweet corn, and 250 milligrams of ascorbic acid for mushrooms tends to prevent surface darkening and off-flavor in the top layers of the canned food. The ascorbic acid itself is not detectable by flavor, odor, or appearance and is not a preservative.

You can buy ascorbic acid in drugstores and in some freezer locker plants. It is available in four different forms that may be used in canning: in finely granular form, in tablet form, in an ascorbic-acid-citric-acid mixture, or in an ascorbic-acid-sugar mixture. The latter provides a very simple and convenient way of adding ascorbic acid to canned fruit. The label on these mixtures will list the ingredients they contain and how they should be used. For sweet corn, the granular or tablet form is more desirable than a mixture with citric acid or sugar in it. The ascorbic acid tablets sold in drugstores are made to contain either 25 milligrams, 50 milligrams, or 100 milligrams. If you use the tablet form for canning, crush the tablets and dissolve them in water before adding to the food in the jar. Allow 1 teaspoon of water for each 150 milligrams of ascorbic acid. Add 1 teaspoon of this solution to each pint jar of food before putting in the boiling liquid or sirup.

EQUIPMENT FOR CANNING

Equipment for canning includes:

Boiling-water-bath canner	Long-handled slotted spoon
Steam-pressure cooker	Stainless-steel paring knife
Jars, covers, rubbers	Jar tongs
Shallow pans	Cutting knife and board
Kettles	Vegetable brush
Colander	Pot holders
Wire basket or cheesecloth	Bowls
Jar funnel	Large kettles or dishpans
Measuring cup and spoons	Scissors
Ladle or dipper	Household scales

Utensils used in preparing food for canning may be aluminum, enamelware, glass, re-tinned metal, or stainless steel in good condition. Avoid copper, iron, and galvanized iron utensils. Some foods are discolored when they are placed in a copper, iron, or galvanized iron container. A copper or iron kettle will destroy vitamin C in tomatoes. Acid foods heated in galvanized utensils are apt to dissolve zinc from the utensil, which causes an undesirable metallic flavor in the food. Make certain everything used for canning is thoroughly clean.

Boiling-water bath

Boiling-water-bath canners may be purchased, but any big, clean kettle with a tight-fitting lid will do if it is deep enough to hold the jars upright on a rack and permit the water to boil 1 or 2 inches over the tops of the jars. The rack should have openings and may be made of metal, wire, or wood. It is used to keep the jars from touching the bottom of the canner. Jars should stand free on all sides, without touching each other or the side walls.

Steamer

A steamer should not be confused with a steam-pressure cooker. In a steamer a small amount of water produces the steam for processing. Most of the ones used for canning have shelves for holding jars. To be effective a steamer must have a good circulation of steam.

If a steamer is used, the time given for the boiling-water bath should be increased by one-fourth since the processing time is counted from the moment the containers are put into the steamer.

Steam-pressure canner and cooker

Pressure canners and cookers that have a capacity of from 12 to 25 liquid quarts (or 6 to 18 quart jars) are used in home canning. There are various models on the market. Some pressure saucepans of 4-quart size or more are deep enough to hold a few pint jars. These may be used for canning if the saucepan has a control or indicator for 10 pounds pressure.

A pressure cooker which is in good working order and is properly operated is as safe to use as any other cooking utensil. The petcock of a pressure cooker, when open, provides a vent for the escape of air and steam. When the petcock is closed it holds the steam inside. The petcock may be in one unit with the safety valve, or each may be a separate part. The safety valve is so adjusted that, if the pressure in the cooker is allowed to rise too high, steam is automatically released through the valve.

BEFORE YOU BEGIN TO CAN

Check and wash jars

All jars should be washed in hot water with detergent. When soap is used, a water softener will remove grease films. Rinse well in hot water. Also wash and rinse all lids except those with sealing compound. Heat the washed jars in clean water, just before using. Some metal lids with sealing compound need boiling; others need only to be dipped in hot water. Follow the manufacturer's directions. Do not use chipped or warped jars or lids.

Jars that have had spoiled food in them should be given special attention; otherwise the spoiled food of one year may cause spoilage another year. Scrub such jars thoroughly with a brush, hot water, detergent, and washing soda. Then cover jars with water containing $\frac{1}{2}$ cup of washing soda to 1 gallon of water and boil for 10 minutes. Do not use aluminum pans for this purpose.

Check rubber rings for jars

Rubber rings or lids with flowed-on sealing composition which have rubber in them are needed to seal all jars. If rubber rings are used, be sure they are new ones of the right size for the jars, but do not test the rings by stretching. Since the rings are very important in getting a tight seal on the jars, it is better not to risk spoilage by using old ones. Wash rings in hot soapy water and rinse well. For metal lids with sealing compound follow manufacturer's directions.

Check pressure cooker

Before the canning season begins, make certain that your pressure canner or cooker is in good working order. It's a good idea to reread the directions that came with your cooker.

If you have a dial gauge, be sure that it is accurate. Your county home demonstration agent at the county extension service office has equipment for checking gauges. She will be glad to check yours. It is not necessary to remove the gauge from the lid for checking.

Test the cooker to see if steam leaks from under the cooker lid. A little steam usually escapes around a weight-type gauge but none should escape elsewhere. Examine the sealing edges of the cooker and cover. If edges are not smooth, clean with fine scouring powder. If the gasket can be reversed, turn it to improve the seal. Check to see if the cooker needs a new gasket or dial.

Be sure the pressure cooker is clean. Wash it thoroughly but do not immerse the lid in water. Openings to the pressure gauge, safety valve, and petcock should be clean. Clean them by drawing a piece of string or pipe cleaner through the openings. To clean the removable petcock and safety valve, soak them in vinegar, then wash and dry them before replacing. To clean the ball and socket type of safety valve, remove the ball and clean it with silver polish. If a safety valve is not well cleaned, it may not release steam properly and pressure may go too high. If the safety valve fails to open, it may cause a serious accident. The petcock also needs to be cleaned in order to work freely and to keep steam from escaping during cooking.

In addition to the safety valve, there are safety plugs which go into action only if pressure or temperature goes dangerously high. Safety plugs made of a metal alloy melt when pressure gets too high or when the cooker boils dry. Those of composition type are blown out by too high a pressure. New safety plugs are available from the manufacturer.

Other suggestions for general care of your pressure cooker

Do not let water stand in the cooker. Water left in the cooker may pit, darken, and roughen the surface. Deep pitting weakens the wall of the cooker. Be careful not to chip or nick the edges of cooker or cover, as this may also cause leakage of steam. Wash the cooker thoroughly after each use, rinse, and dry well. Remove and wash the ball from the ball and socket type of safety valve after each use. When you are not using the cooker, store it stuffed with crumpled newspapers to absorb moisture and odors, and invert lid wrapped in paper on top of cooker.

COMMON TYPES OF CLOSURES FOR GLASS JARS—

FLAT METAL LID



FLAT METAL LID with sealing compound and narrow metal screw band to fit standard Mason jar.

When canning, dip lid in hot water or boil a few minutes, according to manufacturer's directions. Fill jar; wipe rim clean. Put lid on with sealing compound next to glass. Screw metal band down tight by hand. When band is screwed firmly, this lid has enough give to let air escape during processing.

After canning. This is a self-sealing type. Do not tighten further when you take jar from canner; you may break the seal.

To test seal the day after canning, remove screw band carefully. Do not force it. If properly sealed, the jar can be gently lifted by the lid.

FLAT GLASS LID



FLAT GLASS LID and top-seal rubber ring, with metal screw band, to fit standard Mason jar.

When canning, fill jar; wipe rim clean. Fit wet rubber on glass lid. Put lid on jar, rubber side down. Screw band on until it is almost tight, then turn back almost a quarter turn; be sure jar and band mesh. Caution: if band is screwed too tight, jar may break.

After canning. As soon as you take the jar from canner, screw band down tight, to complete seal.

To test seal the day after canning, remove screw band carefully. Do not force it or seal may be broken. If seal is tight, the jar and contents can be lifted by the lid.

HOW TO USE THEM

WIRE BAIL

When canning, fit wet rubber ring on ledge at top of empty jar. Fill jar; wipe rubber ring and jar rim clean. Put on glass lid. Slip the bail into place over the lid, so it fits into groove. If food is packed hot, push the short wire down to complete seal before processing.

After canning, as soon as you take jar from canner, push short wire down to complete seal, if food is packed cold or raw.

To test seal the day after canning, open bail and spring. If seal is tight, the jar and contents can be lifted by the lid.



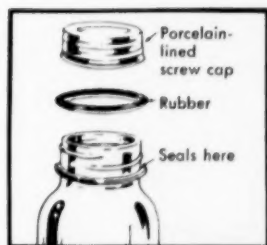
WIRE-BAIL type jar with glass lid and rubber ring.

PORCELAIN-LINED ZINC CAP

When canning, fit wet rubber ring on jar shoulder, but do not stretch more than necessary. Fill jar; wipe the rubber ring and the jar rim clean. Then screw cap down firmly and turn it back $\frac{1}{4}$ inch.

After canning. As soon as you take jar from canner, screw cap down tight, to complete seal.

To test seal the day after canning, hold the jar and turn partly on its side to see whether there is a leak.



PORCELAIN-LINED ZINC CAP with shoulder rubber ring to fit standard Mason jar.

TIN CANS

Tin cans need a tin can sealer. If you wish information about canning in tin, consult your county home demonstration agent.

APPROXIMATE YIELD OF CANNED FRUIT AND VEGETABLES FROM FRESH PRODUCE

Fruit	Fresh	Canned	Amount of fresh vegetable to make 1 pint canned	
Apples	2½-3 lbs. 1 bushel	1 qt. 16-20 qts.	Asparagus	1½-2 lbs.
Berries	1¼-2 qts. 24-qt. crate	1 qt. 12-18 qts.	Beans, Lima in pods	2-2½ lbs.*
Cherries	1½-2 qts. 14 lbs.	1 qt. 5 qts.	Beans, snap	¾-1 lb.*
Grapes	3 lbs. 1 bushel	1 qt. 16 qts.	Beets, without tops	1¼-1½ lbs.*
Peaches	2-3 lbs. 1 bushel	1 qt. 16-25 qts.	Carrots, without tops	1¼-1½ lbs.
Pears	2-3 lbs. 1 bushel	1 qt. 18-27 qts.	Corn, sweet	4-6 ears
Pineapple	2 1 crate	1 qt. 15 qts.	Greens	1-1½ lbs.
Plums	2-2½ lbs. 1 bushel	1 qt. 22-25 qts.	Peas, green in pods	1-1½ lbs.*
Straw- berries	1½-2 qts. 24-qt. crate	1 qt. 12-16 qts.	Pumpkin, in shell	2 lbs.
Tomatoes	2½-3 lbs. 1 bushel	1 qt. 20 qts.	Squash, sum- mer, winter	1-1¼ lbs. 2 lbs.

* Yield of canned vegetables from 1 bushel; lima beans in pod—12 to 16 pints; snap beans—40 pints; beets without tops—28 to 40 pints; green peas in pods—16 pints.

Dip tomatoes and peaches, only, into boiling water to remove skins easily.

Pack pear halves with cups down.



HOW TO CAN FRUITS, TOMATOES, AND JUICES

Boiling-water bath

Processing times and specific directions for canning fruits, tomatoes, and juices are given in the tables on pages 13 to 17. The following are general procedures for canning:

1. Prepare the boiling-water bath so the water will be boiling when the fruit is ready to be processed.
2. Put some tested clean jars in a pan of hot water to keep hot until they are packed.
3. Prepare only as much fruit as you can handle quickly at one time. Wash fruit by lifting it from the wash water rather than by pouring off the water.
4. Some fruits may be packed either hot or cold. Follow directions for each fruit as given in the tables.
5. Prepare from $\frac{3}{4}$ to 1 cup of sirup or fruit juice for each quart jar of fruit. If dry sugar is to be added to jars of fruit, have boiling water and a $\frac{1}{4}$ or $\frac{1}{2}$ cup measure ready. See tables for specific directions.
6. Add salt to tomatoes, if desired, but do not add water. Tomatoes are canned in their own juice. When they are canned whole, additional tomato juice is added. Tomato juice must be strained from crushed heated tomatoes. See tables for directions.
7. Use clean hot containers. Set the hot jars in a shallow pan of hot water or a pan lined with a cloth. Fill the jars, and work the blade of a table knife down the sides of the jars to remove air bubbles. Add more liquid if needed to cover food. Leave head-space at top of jar as directed. Wipe off sealing surface of jars. Adjust lids according to directions for the type of jar used.

Work out air bubbles with table knife.

Wipe sealing surface before adjusting lids.



8. For fruits packed hot: Lower the containers of fruit carefully onto the rack in the boiling water. For fruits packed cold or raw: Have water bath hot; not boiling. Do not let the jars touch each other. Have water at least 1 inch above the tops of the jars, but do not pour boiling water directly on glass jars. Cover the water bath. Bring water back to a boil as quickly as possible. Process for the recommended time, counting from the time the water returns to a boil. The water should be kept boiling for as long as the timetable recommends the food be processed. If necessary, boiling water should be added to keep the jars covered.
9. When the processing time is up, remove the containers. Complete the seal at once if the jars have been only partially sealed. Cool the jars promptly. Put them in a well-ventilated but not drafty place. Set them upright and far apart on a surface that is not cold to the touch.
10. After jars have cooled 12 hours or overnight, test the seals. If any have faulty seals, they should be reprocessed as though they were fresh. After testing the seals, wipe the jars, label, and store in a cool, clean, well-ventilated place.

SUGAR SIRUPS FOR FRUITS

Approximate per cent		Cups of sugar	Cups of water or fruit juice
Very thin	(20% sirup)	1	+ 4
Thin	(30% sirup)	2	+ 4
Medium	(40% sirup)	3	+ 4
Thick	(50% sirup)	4	+ 4

For *sirup*: heat water or juice, add sugar, and bring to a boil.

For *juice* to be used over the fruit: crush thoroughly ripe, juicy fruit, such as berries, cherries, and plums, bring to a boil, and strain. Add a little water to apples, peaches, and pears; simmer until soft and strain.

For *fruit canned without sugar*: Can the fruit in its own juice, in extracted juice, or in water. Use the same directions and timetables as given for fruits canned with sugar or sirup. Sugar helps the fruit keep its firm texture, color, and flavor but it is not essential to prevent spoilage. Non-sugar sweeteners may be added to canned fruit just before it is served.

For *added flavor*: Put $\frac{1}{8}$ teaspoon of salt in each quart container of fruit.

Before you start, be sure you understand the general procedures for canning (pages 11 and 12). It's a good idea, also, if you are canning fruits, to consult the canning charts to learn what kind of sirup you will need—very thin, thin, medium, or thick. Then refer to the table for **sugar sirups** (page 12).

Fruits	How Packed	Selection and Preparation	Boiling Water Bath Glass Jars	
			Pints	Quarts
Apples	Packed hot Very thin or thin sirup ($\frac{3}{4}$ to 1 cup for each quart jar) $\frac{1}{2}$ -inch headspace	Can some apples in early winter while flavor is at its best. Use sound, slightly underripe, tart apples. Prepare sirup. Wash, peel, quarter, or slice apples thin. Darkening can be prevented by placing in salt water (1 tablespoon salt to 2 quarts water). This step may be omitted if you work quickly. Drain and boil 1 minute in sirup or water in covered pan. Pack and cover with hot sirup or water. Adjust lids. Process.	15	15
Applesauce	Packed hot $\frac{1}{4}$ -inch head- space See page 4 for using ascorbic acid, if desired	Make applesauce. Sweeten to taste if desired. Pack boiling hot in clean hot jars. Add ascorbic acid if desired to prevent darkening. Adjust lids. Process.	10	10
Berries (soft) Blackberries Dewberries Loganberries Raspberries	Packed raw Medium sirup ($\frac{3}{4}$ to 1 cup for each quart jar) $\frac{1}{2}$ -inch headspace	Use fully ripe berries. Wash 1 or 2 quarts at a time; gently lift the berries out of the water. Cap and stem if necessary. Drain well. Prepare sirup or juice. (For juice: extract from riper berries by crushing, heating, and straining.) Pack soft berries tightly, without crushing, in clean hot jars. Cover with boiling sirup made with juice or water. Adjust lids. Process.	10	15
Berries (firm) Blueberries Currants Elderberries Huckleberries	Packed hot Heated with $\frac{1}{2}$ cup sugar to a quart of fruit $\frac{1}{2}$ -inch headspace	Wash and drain as for soft berries. Add sugar to firm berries. Cover pan and bring to a boil. Shake pan to prevent berries from sticking. Pack hot berries and some of the juice in clean hot jars. Adjust lids. Process.	10	15

Before you start, be sure you understand the general procedures for canning (pages 11 and 12). It's a good idea, also, if you are canning fruits, to consult the canning charts to learn what kind of sirup you will need—very thin, thin, medium, or thick. Then refer to the table for **sugar sirups** (page 12).

Fruits	How Packed	Selection and Preparation	Boiling Water Bath Glass Jars	
			Pints	Quarts
Cherries (sweet or sour)	Packed raw Sour cherries— thick sirup ($\frac{1}{2}$ to 1 cup per quart) Sweet cherries— thin or medium sirup Or add $\frac{1}{4}$ to $\frac{1}{2}$ cup sugar to quart jar $\frac{1}{2}$ -inch headspace	Wash, remove stems, grade, and pit if desired. If left whole, pricking helps prevent splitting. Prepare sirup or juice if either is to be used or have sugar and boiling water ready. Pack cherries in clean hot jars. Cover with boiling sirup or juice; or pack cherries in jars, add sugar and cover with boiling water. Adjust lids. Process.	20	25
	Packed hot Heated with $\frac{1}{2}$ cup sugar to a quart of fruit or sirup as above $\frac{1}{2}$ -inch headspace	Wash, remove stems, grade, and pit, if desired. Add $\frac{1}{2}$ cup sugar to each quart of cherries. (For unpitted cherries add a little water to pan.) Cover pan and bring to boil, shaking pan to prevent sticking. Or bring cherries to a boil in hot sirup. Pack hot in clean jars. Adjust lids. Process.	10	10
Gooseberries	Packed hot Medium or thick sirup ($\frac{1}{2}$ to 1 cup per quart) $\frac{1}{2}$ -inch headspace	Wash gooseberries, drain, and cut off stem and blossom ends. For best flavor, prick each berry with a fork. Put 1 quart of berries at a time into 3 cups of boiling sirup for 15 to 30 seconds. Drain in colander until several quarts are ready. Pack closely in clean hot jars. Cover with boiling sirup in which gooseberries were heated. Adjust lids. Process.	15	20

Peaches	Packed raw Thin or medium sirup ($\frac{1}{2}$ to 1 cup per quart) or add $\frac{1}{2}$ cup sugar to quart jar $\frac{1}{2}$ -inch headspace See page 4 for using ascorbic acid, if desired	Use fully ripe but not soft fruit. Dip in boiling water $\frac{1}{2}$ to 1 minute. Dip quickly into cold water. Peel, halve, and remove pits. To keep from darkening, dip in salt water (1 tablespoon of salt to 2 quarts of water). This step may be omitted if you work quickly. Drain well. Prepare sirup, if sirup is to be used. Pack peach halves in clean hot jars with cut side down and edges overlapping. Add ascorbic acid, if desired. Cover with boiling sirup; or add sugar to each quart jar of fruit and add boiling water to cover fruit. Adjust lids. Process.	25	30
	Packed hot Thin or medium sirup ($\frac{1}{2}$ to 1 cup per quart) $\frac{1}{2}$ -inch headspace	Put peach halves in boiling sirup and heat through. (If desired, boil a few cracked pits in the water for sirup.) Pack peach halves in clean hot jars. Add ascorbic acid, if desired. Then add sirup. Adjust lids. Process. If peaches are very juicy, heat fruit with $\frac{1}{2}$ cup sugar to 1 quart of fruit, adding no liquid. Pack hot and process.	15	15
Pears	Packed raw Thin or medium sirup ($\frac{1}{2}$ to 1 cup per quart) $\frac{1}{2}$ -inch headspace See page 4 for using ascorbic acid, if desired	Can slightly underripe pears. Peel, cut in half lengthwise, and core. Small pears may be canned whole. To keep from darkening dip in salt water (1 tablespoon of salt to 2 quarts of water). This step may be omitted if you work quickly. Prepare sirup. Pack pear halves tightly with cups down; or whole pears with stems up for first layer and other layers alternately stems down and up. Add ascorbic acid, if desired. Cover with boiling sirup, adjust lids. Process.	25	30
	Packed hot Thin or medium sirup ($\frac{1}{2}$ to 1 cup per quart) $\frac{1}{2}$ -inch headspace	Peel pears, cut in half lengthwise, and core. Prepare sirup. Put pears in boiling sirup, bring to boil, and boil gently 1 minute or until heated through. Pack in clean hot jars. Add ascorbic acid, if desired. Cover with boiling sirup. Put in a piece of stick cinnamon if desired. Adjust lids. Process.	15	15

Before you start, be sure you understand the general procedures for canning (pages 11 and 12). It's a good idea, also, if you are canning fruits, to consult the canning charts to learn what kind of sirup you will need—very thin, thin, medium, or thick. Then refer to the table for **sugar sirups** (page 12).

Fruits	How Packed	Selection and Preparation	Boiling Water Bath Glass Jars	
			Pints	Quarts
Pineapple	Packed raw Thin or medium sirup ($\frac{2}{3}$ to 1 cup per quart) or add $\frac{1}{4}$ to $\frac{1}{2}$ cup sugar to quart jar $\frac{1}{2}$ -inch headspace	Can only fully ripe, sound pineapple. Peel, remove eyes, slice or cut in pieces, and remove the core. Prepare sirup, if sirup is to be used. Pack tightly in clean hot jars. Cover fruit with boiling sirup; or add $\frac{1}{4}$ to $\frac{1}{2}$ cup sugar to a quart jar of fruit and cover with boiling water. Adjust lids. Process.	30	30
Plums	Packed hot Sirup: Thick for sour Medium for sweet ($\frac{2}{3}$ to 1 cup per quart) $\frac{1}{2}$ -inch headspace	Can ripe plums just as they begin to get soft. If too green they will be sour and lack flavor; if too ripe they become mushy. Wash and remove stems. If canned whole, prick skins to prevent bursting. Freestone varieties may be cut in half and pitted. Prepare sirup. Put plums in boiling sirup and heat through. Pack tightly in clean hot jars, cover with boiling sirup. Adjust lids. Process.	15	15
Rhubarb	Boiling water, dipped: Thick sirup ($\frac{2}{3}$ to 1 cup per quart) $\frac{1}{2}$ -inch headspace	For best flavor, texture, and color, can young tender stalks. Later cuttings are less acid and not so desirable for canning. Wash and cut in $\frac{1}{2}$ -inch pieces. Prepare sirup. Dip in boiling water $\frac{1}{2}$ minute. Pack tightly in clean hot jars. Cover with boiling sirup. Adjust lids. Process.	20	25
	Packed hot Partly cooked with sugar $\frac{1}{2}$ -inch headspace	Add $\frac{1}{2}$ cup sugar to a quart of raw cut rhubarb. Let stand a few minutes to draw out juices. Bring to a boil or bake covered until somewhat tender. Pack hot in clean hot jars. Adjust lids. Process.	10	10

Tomatoes	Packed cold 1 teaspoon salt to 1 quart ½-inch headspace	Use ripe tomatoes. Do not can overripe tomatoes or those from which decayed spots have been removed. Wash in cool water. Dip 8 or 10 at a time into actively boiling water about ½ minute or until skins slip easily, then dip quickly in cold water. Cut out stem ends and peel. Pack whole or cut up peeled tomatoes in clean hot jars. Press tomatoes down until juice fills jar. Add salt. Adjust lids. Process.	35	45
	Packed hot 1 teaspoon salt to 1 quart ½-inch headspace	Heat cut peeled tomatoes in saucepan. Do not add water. When boiling, pack in clean hot jars. Add salt. Adjust lids. Process.	10	10
Tomato Juice	Packed hot with 1 teaspoon salt to 1 quart of juice No headspace	Use ripe, juicy, sound tomatoes. Do not use tomatoes from which decayed spots have been removed. Wash, remove stem ends, and quarter but do not peel. Cover kettle and simmer gently until soft. Put through strainer or fine-colander quickly. Add salt, reheat to boil. Fill clean hot jars to top with boiling hot juice. Adjust lids. Process.	10	10
Fruit Juices Apple, berry, red cherry, currant, grape, rhubarb	Packed hot 1 to 2 table- spoons of sugar per pint of juice if desired. No headspace	Wash the fruit. Cut apples, and rhubarb, remove grapes from stems, and crush soft fruits. Add a little hot water except for juicy berries. Heat only 165° to 170° F. Strain while hot through cloth bag. Add sugar if desired. Fill clean hot jars or bottles to overflowing with hot juice. Remove foam. Seal immediately. Process just below boiling point, at 180° F. If bottles and caps are used, lay bottles on their sides for processing, to sterilize caps.	5 (180° F.)	5 (180° F.)
Grape juice (quick method)	Pack grapes raw ¼ to ½ cup sugar to quart jar No headspace	Wash and stem sound grapes. Pack clean hot jars one-third to one-half full with grapes. Add ¼ to ½ cup sugar to a quart and fill jars to top with boiling water. Adjust lids. Process. The juice is ready for use after three weeks. Strain before using.	—	10

HOW TO CAN VEGETABLES

Pressure Cooker

Specific directions for canning each vegetable are given in the tables on pages 20 to 25. The following are general procedures:

1. Put clean tested jars in a pan of hot water to keep hot until they are packed.
2. Get pressure cooker ready. Boil 2 to 3 inches of water in the cooker. For a long processing period, more water may be needed in a cooker with a weight-type gauge, because the weight permits some steam to escape during processing.
3. Heat water for preheating vegetables which are to be packed hot.
4. Select young, tender, but not overripe vegetables and can them fresh. If vegetables cannot be canned soon after harvesting, they should be kept in a cool, airy place. If vegetables are purchased for canning, try to get them from local gardens.
5. Wash the vegetables thoroughly before cutting or peeling. Prepare small lots at a time, washing them in several changes of water. Lift the vegetables out of the water each time.
6. If vegetable is to be preheated, place it in boiling water to cover. Bring water back to full rolling boil; boil for the time indicated in the specific directions in the tables on pages 20 to 25. This cooking water can be used in packing the vegetable. See 9 below.
7. Set hot jars in a shallow pan lined with a cloth. Pack vegetables loosely into clean hot jars. Leave a headspace.
8. Add $\frac{1}{2}$ teaspoon salt to each pint and 1 teaspoon salt to each quart. Salt may be omitted, if desired.
9. Add boiling liquid to just cover vegetables, leaving the amount of headspace indicated in the specific directions in the tables on pages 20 to 25. Some vegetables may need to have boiling water added, for better flavor, instead of liquid from vegetable.
10. After filling jars, work the blade of a table knife down the sides of the jars to remove air bubbles. Wipe the tops of the jars and rubber rings with a clean cloth. Adjust lids according to directions for the type of containers being used. Process for the recommended length of time.
11. Follow manufacturer's directions for using the pressure cooker. In general, place a rack in the bottom of the cooker, and arrange jars so they

do not touch each other or the sides of the cooker. Fasten the cover of the cooker securely, with the petcock open. Some cookers, to fasten correctly, must have the kettle matched with the lid. Look for the guiding marks. If the safety valve is separate from the petcock, close the safety valve at this point.

12. Put the cooker on the heat. Let the steam escape for 7 to 10 minutes before closing the petcock. This step is important to force the air out of the cooker; otherwise the gauge may not indicate the true temperature within the cooker. At 5 pounds pressure, the temperature inside the cooker should be 228°F.; at 10 pounds pressure, 240°F.; and at 15 pounds pressure, it should be 250°F. at sea level. In a small pressure saucepan it takes only 1 minute instead of 7 to 10 to exhaust the air.
13. Process for the length of time indicated in the tables on pages 20 to 25. Begin timing after the recommended pressure is reached. Try to keep a constant even pressure during processing, to help prevent loss of liquid from jars.

The processing time for canning in a *pressure saucepan* is longer than for the large pressure cooker or canner. The smaller cooker heats and cools more quickly. To obtain a comparable heating, add 20 minutes to the processing time given for each vegetable when canning in pressure saucepans that hold three to four pints.

14. At the end of the process time, turn off the heat or slide the pressure cooker off the heat. Let the cooker cool gradually. Do not open the petcock until zero pressure is reached. Then open the petcock immediately but slowly and cautiously. If the petcock is not opened at this time, a vacuum may be created which will draw some of the liquid from the jars and make the lid of the cooker difficult to remove. The dial gauge might also be seriously injured. When you remove the cover, tilt it so that any remaining steam is forced away from you.
15. Remove containers as soon as the pressure cooker is opened. Avoid drafts. Quickly complete seal of partially sealed jars.
16. Cool jars promptly. Set them upright and far apart, on a surface that is not cold to the touch, in a ventilated but not drafty place.
17. After jars have cooled 12 hours or overnight, test the seals. Reprocess any that have faulty seals as if they were fresh. After testing seals, wipe jars, label, and store in a cool, dry, dark place. Do not store near hot pipes or in a place where the products might freeze.

BEFORE YOU START, be sure you understand the general procedures (pages 18 and 19).

Vegetable	Selection and Preparation for Canning	Timetable for Processing
ASPARAGUS	<p>Packed Raw: Sort and wash asparagus; remove scales and tough ends and wash again. Cut into 1-inch pieces. Pack asparagus as tightly as possible without crushing to ½-inch of top. Add ½ teaspoon salt to each pint. Cover with boiling water, leaving ½-inch space at top of jar. Adjust lids. Process.</p> <p>Packed Hot: Sort, wash, and remove coarse scales and tough ends. Cut stalks to fit upright in container and tie in bunches of 20 to 30 stalks. Stand bunches upright in boiling water reaching to bottom of tips and preheat 3 minutes. Turn bunches over on sides and boil ½ minute longer. Remove string. Pack with tips upright in hot jars. Add ½ teaspoon salt to each pint. Cover with boiling liquid if it is free from grit, or with boiling water, leaving ½-inch space at top of jar. Or cut asparagus in 1-inch pieces, preheat, and pack as above. Adjust lids. Process.</p>	<p>Process at 10 pounds pressure Pint jars 25 minutes Quart jars 30 minutes Add 20 minutes more for pressure saucepan</p> <p>Process at 10 pounds pressure Pint jars 25 minutes Quart jars 30 minutes Add 20 minutes more for pressure saucepan</p>
BEANS Lima and shell	<p>Packed Raw: Can only young Lima and shell beans. Shell and wash. Pack prepared raw beans into clean jars. For small beans, fill to 1 inch of top of jar for pints and 1½ inches for quarts; for large beans, fill to ¾ inch of top for pints and 1¼ inches for quarts. Beans should not be pressed or shaken down. Add ½ teaspoon salt to each pint. Fill jar to top with boiling water. Adjust lids. Process.</p> <p>Packed Hot: Shell, wash, and put beans into boiling water to cover and boil 3 minutes. Pack hot in hot jars to 1 inch of top of jar. Add ½ teaspoon salt to each pint. Cover with boiling liquid leaving 1-inch space at top of jar. Adjust lids. Process.</p>	<p>Process at 10 pounds pressure Pint jars 40 minutes Quart jars 50 minutes Add 20 minutes more for pressure saucepan</p> <p>Process at 10 pounds pressure Pint jars 40 minutes Quart jars 50 minutes Add 20 minutes more for pressure saucepan</p>
BEANS Snap	<p>Packed Raw: Can only young and tender beans. Wash, trim ends, and cut in 1-inch pieces. Pack beans tightly into clean jars to ½ inch of top. Cover with boiling water, leaving ½-inch space at top of jar. Add ½ teaspoon salt to each pint. Adjust lids. Process. As soon as jars are removed from canner, complete seals if closures are not the self-sealing type.</p>	<p>Process at 10 pounds pressure Pint jars 20 minutes Quart jars 25 minutes Add 20 minutes more for pressure saucepan</p>

BEANS Snap (cont.)	Packed Hot: Prepare beans as above. Preheat by putting beans in boiling water to cover and boil 5 minutes. Pack hot in hot containers to $\frac{1}{2}$ inch of top of jar. Add $\frac{1}{2}$ teaspoon salt to each pint. Cover with boiling liquid or boiling water leaving $\frac{1}{2}$ -inch space at top of jar. Adjust lids. Process.	Process at 10 pounds pressure Pint jars . . . 20 minutes Quart jars . . . 25 minutes Add 20 minutes more for pressure saucepan
BEANS with Pork and Tomato or Molasses Sauce	Sort and wash dry beans (kidney, navy, or yellow-eye). Put washed beans in boiling water, boil 2 minutes, then remove from heat and let soak 1 hour. Heat to boiling, drain, and save liquid for making either tomato or molasses sauce (see recipes below). Fill each jar $\frac{3}{4}$ full of hot beans. Add small piece of salt pork, ham or bacon, and tomato or molasses sauce. Leave $\frac{1}{2}$ inch at top of jars for space. Adjust lids. Process at once. Tomato sauce: Mix 1 quart tomato juice, 3 tablespoons sugar, 2 teaspoons salt, 1 tablespoon chopped onion, and $\frac{1}{4}$ teaspoon mixture of ground cloves, allspice, mace, and cayenne pepper. Heat to boiling. Or mix 1 cup tomato catsup with 3 cups of water or soaking liquid from beans and heat to boiling. Molasses sauce: Mix 1 quart water or soaking liquid from beans, 3 tablespoons dark molasses, 1 tablespoon vinegar, 2 teaspoons salt, and $\frac{3}{4}$ teaspoon ground mustard. Heat to boiling.	Process at 10 pounds pressure Pint jars . . . 65 minutes Quart jars . . . 75 minutes Add 20 minutes more for pressure saucepan
BEETS Cut or Baby	Can only young tender beets; leave root and 1 inch of stem. Boil or steam 15 to 20 minutes or until skins slip easily or heat for 2 minutes in a pressure cooker at 15 pounds pressure to loosen skins. Slip off skins, stems, and root ends. Leave baby beets whole; cut up or slice larger beets. Pack hot in hot jars. Add $\frac{1}{2}$ teaspoon salt to each pint. Cover with boiling water leaving $\frac{1}{2}$ -inch space at top of jar. Adjust lids. Process.	Process at 10 pounds pressure Pint jars . . . 25 minutes Quart jars . . . 35 minutes Add 20 minutes more for pressure saucepan
BEETS Pickled	Cut off beet tops, leaving 1-inch of stem and the root. Wash beets, cover with boiling water, and cook until tender. Remove skins and slice beets. For pickling sirup, use 2 cups vinegar (or $1\frac{1}{2}$ cups vinegar and $\frac{1}{2}$ cup water) to 2 cups sugar. Heat to boiling. Pack beets in jars to $\frac{1}{2}$ -inch of top. Add $\frac{1}{2}$ teaspoon salt to each pint. Cover with boiling sirup, leaving $\frac{1}{2}$ -inch space at top of jar. Adjust lids. Process.	Process in boiling water Pint jars . . . 30 minutes Quart jars . . . 30 minutes

BEFORE YOU START, be sure you understand the general procedures (pages 18 and 19).

Vegetable	Selection and Preparation for Canning	Timetable for Processing
CARROTS Cut or Small	<p>Packed Raw: Can only young tender carrots. Wash and scrub. Leave whole, slice or dice. Pack raw carrots tightly into clean jars to 1-inch of top of jar. Add $\frac{1}{2}$ teaspoon salt to each pint. Fill jar to top with boiling water. Adjust jar lids. Process.</p> <p>Packed Hot: Prepare carrots as above. Preheat by putting into boiling water to cover and bring to boil. Pack hot into hot jars to within $\frac{1}{2}$-inch of top of jars. Add $\frac{1}{2}$ teaspoon of salt to each pint. Cover with boiling liquid leaving $\frac{1}{2}$-inch of space at top of jar. Adjust lids. Process.</p>	<p>Process at 10 pounds pressure Pint jars 25 minutes Quart jars 30 minutes Add 20 minutes more for pressure saucepan</p> <p>Process at 10 pounds pressure Pint jars 25 minutes Quart jars 30 minutes Add 20 minutes more for pressure saucepan</p>
CORN Cream Style	<p>Packed Raw: Can only young, tender, freshly gathered corn. Working quickly, prepare only 2 to 3 dozen ears at a time. Husk corn and remove silk. Wash. Cut off only the tip of the kernels and then scrape the cob. Pack loosely into pint jars only, to 1 inch of top of jars. Add $\frac{1}{2}$ teaspoon salt to each jar. Adjust lids. Process.</p> <p>Packed Hot: Prepare corn as above. Cover with boiling water (about 1 pint of water to each quart of corn). Bring corn to boiling point. Pack hot and loosely into hot jars to $\frac{1}{2}$ inch of top of jar. Add $\frac{1}{2}$ teaspoon salt to each jar. Adjust lids. Process.</p>	<p>Process at 10 pounds pressure Pint jars 95 minutes Add 20 minutes more for pressure saucepan</p> <p>Process at 10 pounds pressure Pint jars 85 minutes Add 20 minutes more for pressure saucepan</p>
CORN Whole-kernel See page 4 for using ascorbic acid	<p>Packed Raw: Husk corn, remove silk, and wash. With a sharp knife, cut off kernels about $\frac{2}{3}$ of the depth of the kernel. Do not scrape the cobs. Pack corn loosely to 1 inch of top of jar. Add $\frac{1}{2}$ teaspoon salt to each pint. Fill to top with boiling water. Adjust lids. Process.</p>	<p>Process at 10 pounds pressure Pint jars 55 minutes Quart jars 85 minutes Add 20 minutes more for pressure saucepan</p>

CORN Whole-kernel (cont.)	Packed Hot: Prepare corn as above. Cover corn with boiling water (about 1 pint to a quart of corn). Bring corn to boiling point. Pack hot and loosely in hot jars to within 1 inch of top of jar. Add ½ teaspoon salt to each pint. Add ascorbic acid, if desired.	Process at 10 pounds pressure Pint jars 55 minutes Quart jars 85 minutes Add 20 minutes more for pressure saucepan
GREENS Beet tops Chard Dandelion Kale Spinach	Can only young, crisp, tender, freshly picked greens. Cut off all tough, fibrous stems and coarse leaves. Wash thoroughly in several changes of water, lifting greens from water. Preheat greens in small amount of boiling water 2 to 4 minutes or until main stems are somewhat wilted; or wilt in a steamer. Pack loosely in hot jars. Cut through greens twice from top to bottom with a sharp knife. Add ½ teaspoon salt to each pint; cover with boiling liquid or water to ½ inch of top of jar. Adjust lids. Process.	Process at 10 pounds pressure Pint jars 55 minutes Add 20 minutes more for pressure saucepan
MUSHROOMS See page 4 for using ascorbic acid	Soak mushrooms in cold water for 10 minutes to remove clinging soil. Trim stems and discolored parts of mushrooms. Wash quickly in clean water. Leave small mushrooms whole; cut larger ones in halves or quarters. Steam 4 minutes or heat gently for 12 minutes without adding liquid in a covered saucepan. Pack hot mushrooms to ½ inch of top of clean hot jars. Add ½ teaspoon salt to each pint. For better color, add ascorbic acid. Adjust lids. Process.	Process at 10 pounds pressure ½-Pint Jars 30 minutes Pint jars 30 minutes Add 20 minutes more for pressure saucepan
PEAS Fresh Green	Packed Raw: Can young tender peas soon after gathering. Shell and wash. Pack raw peas loosely into jars to 1 inch of top of jar. Add ½ teaspoon salt to each pint. Cover with boiling water, leaving 1-inch space at top of jars. Adjust lids. Process. Packed Hot: Shell and wash peas. To preheat peas, put in boiling water to cover and bring to a boil. Pack hot and loosely into hot jars to 1 inch of top of jar. Add ½ teaspoon salt to each pint, and cover with boiling liquid or boiling water, leaving 1-inch space at top of jar. Adjust lids. Process.	Process at 10 pounds pressure Pint jars 40 minutes Quart jars 40 minutes Add 20 minutes more for pressure saucepan Process at 10 pounds pressure Pint jars 40 minutes Quart jars 40 minutes Add 20 minutes more for pressure saucepan

BEFORE YOU START, be sure you understand the general procedures (pages 18 and 19).

Vegetable	Selection and Preparation for Canning	Timetable for Processing
POTATOES White, Whole	Use potatoes 1 to 2½ inches in diameter. Wash, peel, and cook in boiling water for 10 minutes. Drain. Pack hot potatoes to ½ inch of top of clean hot jars. Cover with boiling liquid or water, leaving ½-inch space at top of jar. Add ½ teaspoon salt to each pint. Adjust lids. Process.	Process at 10 pounds pressure Pint jars . . . 30 minutes Quart jars . . . 40 minutes Add 20 minutes more for pressure saucepan
PUMPKIN Mashed	Wash, cut into convenient pieces, remove seeds, and peel. Bake, steam, or cook the pumpkin in boiling water to cover for 10 to 15 minutes, or until tender. Stir and add water, if necessary, to give consistency of pie filling. If desired, put pumpkin and liquid through a colander or strainer. Simmer until heated through. Pack hot in hot jars to ½ inch of top of jar. Adjust lids. Process. Or, cook unpeeled pieces until tender; then scrape flesh from rind; press through colander and proceed as above.	Process at 10 pounds pressure Pint jars . . . 60 minutes Quart jars . . . 70 minutes Add 20 minutes more for pressure saucepan
SAUERKRAUT	Can sauerkraut when it is crisp, firm, matured, and not too acid. Heat the kraut in its own juice until it is hot (110° to 130° F.). Pack loosely in hot jars. Cover kraut with juice, leaving ½-inch space. Adjust lids. Process. Cool jars as rapidly as possible after they have been processed to help keep sauerkraut from softening and darkening.	Process in boiling water Pint jars . . . 25 minutes Quart jars . . . 25 minutes
SQUASH Summer	Packed Raw: Wash but do not peel. Trim ends. Cut squash into ½-inch slices; halve or quarter to make pieces of uniform size. Pack raw squash tightly into clean jars to 1 inch of top of jar. Add ½ teaspoon salt to each pint. Fill jars to top with boiling water. Adjust lids. Process.	Process at 10 pounds pressure Pint jars . . . 25 minutes Quart jars . . . 30 minutes Add 20 minutes more for pressure saucepan

SQUASH Summer (cont.)	Packed Hot: Wash and cut squash as above. Put the pieces into boiling water to just cover; let boil for ½ minute. Pack hot in hot jars, add ½ teaspoon salt to each pint and cover with boiling liquid leaving ½-inch space at top of jar. Adjust lids. Process.	Process at 10 pounds pressure Pint jars . . . 30 minutes Quart jars . . . 35 minutes Add 20 minutes more for pressure saucepan
Winter	Follow the directions for pumpkin, above.	
TOMATOES	See fruits, page 17.	
VEGETABLE MIXTURES	Any mixture of vegetables may be canned for use later in soups, salads, or casserole dishes. Some suggestions are: equal parts of peas, carrots, and snap beans; equal parts of corn, Lima beans or snap beans, and celery; or 1 chopped green pepper, 1 small sliced onion, 1 cup each of corn and shell beans, and 4 cups of peeled, cut tomatoes. Prepare each vegetable as if it were to be canned separately; cut into small, uniform pieces as needed. Put them all into a small amount of boiling water (omit water for tomato mixture) and boil for 3 minutes. Pack hot in hot jars leaving ½-inch space at top of jar. Add ½ teaspoon salt to each pint. Adjust lids. Process.	Process for the length of time recommended for the vegetable that takes longest to process.
VEGETABLE and Meat Stew Raw Pack	Mix 2 quarts (8 cups) stewing beef cut in 1½-inch cubes; 2 quarts of potatoes, pared or scraped, and cut in ½-inch cubes; 2 quarts carrots, pared or scraped and cut in ½-inch cubes; 3 cups celery cut in ¼-inch pieces; 7 cups of onions, peeled, and left whole if an inch or less in diameter, or sliced if larger. Fill jars with raw meat-vegetable mixture, leaving no space. Add ½ teaspoon salt to each pint. Do not add liquid. Adjust lids. Process.	Process at 10 pounds pressure Pint jars . . . 60 minutes Quart jars . . . 75 minutes Add 20 minutes more for pressure saucepan

STORAGE OF CANNED FOOD

The seals of the jars should be tested as recommended on pages 8 and 9, before the jars are stored in a cool, dry, clean place at a temperature below 70° F. Canned food kept in a warm place near hot pipes or a furnace may change in color and flavor. It is wise to use up all canned food within a year. Freezing of canned food does not cause spoilage but may cause undesirable changes in flavor and texture. If the seal is broken, the food will spoil. If leaks appear in jars of frozen food, the food in them should be used immediately or kept frozen until used.

SPOILAGE

Examine food before using

Examine canned food carefully for indications of spoilage such as spurting liquid when the jar is opened, "off" odor or color, slimy texture, cloudy or frothy liquid, sediment of liquid and mold on surface. Foods suspected of being spoiled should be discarded. Vegetables and meat that have not been prepared according to recommended methods and processed in a pressure cooker in good working order should be boiled for ten minutes before they are tasted. This precaution is recommended to avoid danger of botulinus poisoning.

Botulinus poisoning

Botulinus poisoning is a food poisoning which is fatal but not frequent and is caused by the most dreaded bacteria in canning—*clostridium botulinum*. It is possible for vegetables and meat canned in a boiling-water bath or equipment other than a pressure cooker to contain this poison without showing signs of spoilage. Sometimes a gas forms or the food is dark or mushy and has a cheesy or putrid odor.

Vegetables and meat that have not been prepared according to recommended methods and processed in a pressure cooker in good working order should be boiled for ten minutes before they are tasted. This precaution is recommended to avoid danger of botulinus poisoning.

Other types of spoilage

There are other types of spoilage that are not poisonous but which may make the food unwholesome. In fruit and fruit juices there may be *fermentation* with a bubbly and cheesy, alcoholic odor and sour taste. In fruit, fruit juices, and tomato products there may be *swells* with a gaseous, frothy ap-

pearance and bad odor and *mold*, a fuzzy grayish or white growth, on the surface of the food. If the mold on the surface of a canned fruit, juice, or tomato product is a *light* mold, it may be removed and the rest of the fruit or juice used. A broken seal may often cause mold to appear on food that has been properly prepared and processed and stored for some time.

Vegetables and meat are also subject to mold. Such spoilage may be poisonous in vegetables and meat. Other types of spoilage in vegetables, but not in meat, may include the following: "flat-sour" which has an unpleasant odor and a disagreeable sour or bitter flavor. With this type of spoilage no gas is present but there is usually a cloudy, sloppy appearance in the food. "Flat sour" may be found in shelled beans, peas, corn, pumpkin, greens, mature snapbeans and tomatoes. "Flat sour" is likely to occur if canned foods have been stored in a place that is not sufficiently cool; or if there has been too much delay—especially on hot, humid days—in gathering, preparing and processing the foods, and in cooling jars. Cleanliness, of course, is important. "Swells" occur where gas is present and may be found in canned greens, mature peas, shelled beans, and corn; "sulfide spoilage" with no gas present shows up, with a grayish or black discoloration throughout the jar, in corn, mature peas, and beans. Such spoilage has a rotten egg odor. "Swells" and "sulfide spoilage"—like "flat sour"—may be the result of improper storage or insufficient speed in the canning process.

Before using any vegetables or meat not canned in a pressure cooker, bring food to a boil and boil for ten minutes before tasting. If there are signs of spoilage the food should be so disposed of that it will not come into contact with humans or animals.

Reasons for spoilage

The chief reasons for spoilage of canned foods are:

1. Use of poor products
2. Improper handling of food
3. Underprocessing
4. Faulty seals
5. Improper storage

Spoilage should not occur if directions given in this bulletin are carefully followed.

SOME CANNING PROBLEMS AND HOW TO PREVENT THEM

Product dark at top of container:

Preheat food for length of time recommended. Be sure to cover contents of jar completely with boiling hot liquid or sirup.

Run a knife blade along inside of jar to work out air bubbles.

Complete seal, if necessary, immediately after processing.

Add ascorbic acid to applesauce, mushrooms, peaches, pears, and sweet corn. See page 4 for directions.

Remarks: The darkening is not, in itself, a sign of spoilage.

Change of color throughout jar of food as:

fading; uneven color; different color; darkening

Keep food cool after gathering and before canning.

Use fresh, young, tender products; be sure fruit is evenly ripened.

Preheat the product quickly for recommended length of time to stop enzyme action.

Avoid using iron and copper utensils.

Avoid overprocessing.

Brownish discoloration in corn is due to using corn that is either too young or too old; choose corn in which the milk is still liquid. Do not overprocess.

Remarks: Pink or blue color in canned apples, peaches, pears, and pineapple may be due to chemical changes in coloring matter of fruit. Fruit grown in very dry, hot weather often turns pink when preserved. Water in some localities may cause color changes. Liquid or sirup dissolves some of the color of fruit or vegetables.

Cloudiness:

Do not use bruised, overripe, or overmature products.

Preheat and process only as long as recommended.

Handle ripe tender products carefully.

Use cooking salt instead of table salt.

Use good quality sugar.

Can peas and beans right after shelling or keep cool in shallow container until canned.

Remarks: Cloudy liquid or sirup or fruit juice will give the product a cloudy appearance. Cloudiness may be caused by hard water or by starch sediment in overmature vegetables such as beans and peas. Cloudiness may indicate spoilage. Flat sour and botulinus spoilage are often accompanied by cloudiness. Examine to see if there is an off odor when the jar is opened.

Jars of food not covered with liquid; loss of liquid from jars:

Work out air with table knife after liquid is added. Add more liquid if it is necessary to fill in spaces between layers of fruit.

Avoid tipping jars in processing kettle.

Maintain constant even pressure during processing of jars of food.

At the end of processing time remove pressure cooker from heat.

Allow natural cooling of pressure cooker and open petcock as soon as zero pressure is reached.

Seal jars immediately after removing from processing kettle.

Remarks: Not a sign of spoilage. Food usually dries out and undergoes undesirable changes in color and flavor.

Floating:

To drive out air, preheat food as recommended.

Avoid overcooking or overprocessing.

Do not use overripe fruit.

Fill container full of food and shake down the jar, leaving recommended headspace; then cover with liquid.

Avoid too heavy a sirup for fruit.

Remarks: Too much air in cells of food may cause floating. Pre-heating shrinks the product and makes it easier to pack.

INDEX

- Air, removal of from jars 11, 18
 removal of from pressure cooker . 19
- Apples 13
 amount for 1 quart 10
 applesauce 13
- Ascorbic acid, to prevent
 darkening 4
- Asparagus 20
 amount for 1 pint 10
- Bacteria 3
- Beans
 lima, shell and snap 20-21
 amount for 1 pint 10
 with pork and tomato or
 molasses sauce 21
- Beet tops 23
- Beets 21
- Beets, pickled 21
 amount for 1 pint 10
- Berries (see also specific fruit)
 soft 13
 firm 13
 amount for 1 quart 10
- Blackberries 13
- Blueberries 13
- Boiling-water bath . . . 3, 5, 11, 12, 26
 timetables for fruits 13-17
- Botulinus poisoning 26
- Canning, as a method of
 preservation 3
 equipment for 5-9
 fruits, tomatoes, juices 10-17
 in boiling-water bath . . . 3, 5, 11, 12
 in glass jars 8-9
 in open kettle 4
 in oven 4
 in pressure cooker 3, 6, 18, 19
 in steamer 5
 in tin cans 9
- methods, recommended 3
 not recommended 4
 powders and preservatives . . . 4
 problems, and how to
 prevent them 28-29
 timetables 13-17, 20-25
 vegetables 18-25
- Carrots 22
 amount for 1 pint 10
- Chard 23
- Cherries 14
 amount for 1 quart 10
- Closures for glass jars 8-9
- Cloudiness 28-29
- Color change in canned food . . . 28
- Containers 8, 9
- Cooling of canned food 12, 19
- Corn 22-23
 cream style 22
 whole kernel 22-23
 amount for 1 pint 10
- Dandelion greens 23
- Darkening of canned products . . 28
- Dewberries 13
- Elderberries 13
- Enzymes 3
- Equipment for canning 5-9
 care and checking of 6-7
- Exhausting, of pressure cooker . . 19
- Fading of canned food 28
- Fermentation 26
- Flat sour 27
- Flavor 4, 12, 18, 26, 27
- Freezing, accidental,
 of canned food 26
- Fruit juices 12, 17
- Fruits (see specific fruit) 11-17
 amounts for 1 quart can 10
 canning without sugar 12

- general directions for 11, 12
- specific directions for 13-17
- selection of (see specific fruit)
- timetables for 13-17
- Glass jars 8-9
- Gooseberries 14
- Grape juice 17
- Greens 23
 - amount for 1 pint 10
- Headspace in jars
 - (see also specific product) . . . 11, 18
- Huckleberries 13
- Jars 6, 8, 9
 - cleaning of 6
 - common types of closures for . . 8-9
 - how to test 8-9
 - how to use 8-9
 - sealing of 8-9
- Lids, how to adjust 8-9
- Lima beans 20
- Liquid, loss of from jars 19, 29
- Loganberries 13
- Molds 3, 27
- Mushrooms 23
- Odor in spoiled food 26-27
- Open-kettle processing 4
- Oven processing 4
- Peaches 15
 - amount for 1 quart 10
 - to prevent darkening of 15, 28
- Pears 15
 - amount for 1 quart 10
 - to prevent darkening of 15, 28
- Peas 23
 - amount for 1 pint 10
- Peppers (see Vegetable Mixtures)
- Petcock of pressure cooker . . . 6, 7, 19
- Pineapple 16
 - amount for 1 quart 10
- Plums 16
 - amount for 1 quart 10
- Potatoes, white 24
- Precooking (see specific food)
- Preparation for canning 5-7
- Preservatives 4
- Pressure cooker . . . 3, 5, 6, 7, 18, 19, 26, 27
 - care of 6-7
 - description of 6
 - temperatures in 19
 - use of 18-19
- Pressure saucepan 6, 19
 - timetables for (see specific vegetable)
- Pumpkin 24
 - amount for 1 pint 10
- Quantity of food, for one
 - container 10
- Raspberries 13
- Rhubarb 16
- Rubber rings 5, 6, 8, 9
- Safety valve of pressure cooker . . 6, 7
- Salt, canning without 18
 - for flavor in fruit 12
 - in vegetables 18
- Sauerkraut 24
- Screw bands for jars 8
- Seals, how to complete 8-9
 - faulty 12, 19, 26
 - testing of 8-9, 12, 19, 26
- Shell beans 20
- Sirups for fruits 12
- Spinach (see Greens) 23
- Spoilage, how to avoid 27-29
 - examining for 26-27
- Spoiled products, disposal of . . . 27
 - tasting of 26-27
- Squash, summer 24
 - amount for 1 pint 10
- Squash, winter 25
 - amount for 1 pint 10
- Steamer processing 5
- Steam-pressure cooker
 - (see pressure cooker)

Storage of canned food	26
Sugar, canning with and without .	12
Sugar sirups	12
amount to use (see specific fruit)	
Timetables for processing (see specific product)	
Tin cans, use of	9
Tomato juice	17
Tomatoes	17
amount for 1 quart	10
Vegetable mixtures	25
Vegetables, how to can	18-25
(see also specific vegetables)	
Vitamin C, to prevent darkening .	4,
13, 15, 22, 23, 28	
Water-bath canners, (see boiling-water bath)	
Yeasts	3
Yield of canned fruit from fresh .	10
Yield of canned vegetables from fresh	10



Cooperative Extension Service, New York State College of Home Economics at Cornell University and the U. S. Department of Agriculture cooperating. In furtherance of Acts of Congress May 8, June 30, 1914. M. C. Bond, Director of Extension, Ithaca, New York.